

METASTELMA MEXICANUM (ASCLEPIADACEAE): A NEW
COMBINATION AND RE-EVALUATION OF THE
STATUS OF *BASISTELMA* BARTLETT

MARK FISHBEIN¹ and RACHEL LEVIN
Department of Ecology and Evolutionary Biology,
University of Arizona, Tucson, AZ 85721

ABSTRACT

Intensive collecting in southeastern Sonora, México has clarified the conspecific nature of *Cynanchum wigginsii* Shinnery [*Basistelma angustifolium* (Torr.) Bartlett] and *Basistelma mexicanum* (Brandegee) Bartlett. This species is known from apparently disjunct localities in central Sinaloa, southeastern Sonora, and the United States-México border region in Arizona and Sonora. Apparent distributional gaps between these population systems are probably due to insufficient botanical collecting rather than truly disjunct occurrences. The two entities that we treat as a single species were differentiated in the most recent treatment of these taxa by degree of recurvature of the apical anther appendages and the length of the style apex. These differences were based presumably on examination of very few specimens. Our examination of additional collections from a broad geographic area reveals that both characters vary on a local scale and do not covary consistently; thus recognition of two species is unwarranted. Acceptance of *Metastelma* R. Br. as a genus distinct from *Cynanchum* L. necessitates the new combination, ***Metastelma mexicanum*** (Brandegee) Fishbein & R. Levin. Although separated from *Metastelma* in previous treatments on the basis of the unusual elongate style apex, *M. mexicanum* is clearly a member of this genus; it possesses the comparatively delicate habit, small cuneate-based leaves, and minute flowers with simple corona scales characteristic of *Metastelma*.

RESUMEN

Colecciones intensivas del suroeste de Sonora, México han aclarado la esencia conspécífica de *Cynanchum wigginsii* Shinnery [*Basistelma angustifolium* (Torr.) Bartlett] y *Basistelma mexicanum* (Brandegee) Bartlett. Esta especie se ha encontrado en localidades aparentemente separadas en Sinaloa central, el suroeste de Sonora, y el área de la frontera entre los Estados Unidos y México en Arizona y Sonora. Estos aparentes vacíos distribucionales entre estas poblaciones están probablemente causados por colecciones insuficientes. Las dos especies que presentamos aquí como una especie única se diferenciaban de acuerdo en el estudio más reciente de estas especies por la cantidad de encorvadura de las añadiduras ápicales de las anteras y la longitud del ápice del estilo. Estas diferencias estaban basadas probablemente en el estudio de pocos especímenes. Nuestro estudio de colecciones adicionales de una región más amplia revela que ambos caracteres varían a pequeña escala y no covarían constantemente; por esto el reconocimiento de dos especies no está justificado. La aceptación de *Metastelma* R. Br. como un género distinto de *Cynanchum* necesita la combinación nueva, ***Metastelma mexicanum*** (Brandegee) Fishbein & R. Levin. Aunque estaba separado de *Metastelma* en estudios anteriores por el insólito estilo ápice alargado,

¹ Present address: Department of Botany, Washington State University, Pullman, WA 99164-4238.

M. mexicanum es claramente un miembro de este género; tiene el hábito relativamente delicado, pequeñas hojas cuneadas, y flores diminutas con hojuelas sencillas de la corona que son características de *Metastelma*.

Metastelma R. Br. is a medium-sized genus of probably fewer than 100 species found in both hemispheres of the Americas (Stevens 1985; Liede and Meve 1997). Following Woodson (1941), *Metastelma* has been treated as part of a very broadly circumscribed *Cynanchum* L. by some North American workers (e.g., Standley and Williams 1969; Correll and Johnston 1970; Sundell 1981, 1994; Rossatti 1989). This highly inclusive treatment of *Cynanchum* has not met with general acceptance in North America, and *Metastelma* has been maintained by several systematists (e.g., Shreve and Wiggins 1964; Wiggins 1980; Stevens 1985, 1988). As noted by Liede and Meve (1997), South American workers have also inconsistently recognized *Metastelma*. Recently, Liede (1996, 1997a, b; Liede and Meve 1997) has begun to clarify generic circumscriptions within subtribe *Metastelmatinae* Endl. ex Meisn. (*Cynanchinae* K. Schum.; Liede 1997b). Although these circumscriptions currently appear to be somewhat provisional, species of *Metastelma* have stood out as particularly discordant elements within *Cynanchum* sensu Woodson (Liede and Meve 1997) and the recognition of *Metastelma* appears well founded.

In preparing a treatment of *Metastelma* for a revised flora of the Río Mayo region of northwestern México (Levin and Fishbein in Martin et al. 1998), we found it necessary to provide a single transfer from *Cynanchum* to *Metastelma*. Originally, the specimens in question were identified as *Cynanchum wigginsii* Shinners (Van Devender et al. 1995). Close study of many herbarium collections of *C. wigginsii* [= *Basistelma angustifolium* (Torr.) Bartlett] and the clearly related *Basistelma mexicanum* (Brandege) Bartlett (including the types of both species) revealed that the collections from southeastern Sonora were also similar to the type of *B. mexicanum*. The close relationship of specimens assigned to these taxa was first noted by Bartlett (1909), who erected the genus *Basistelma* to accommodate them as two species. The similarities between the types (and among all collections examined) suggested to us that only a single species was represented. We found that the slight morphological differences in staminal and stylar characteristics noted by Bartlett (1909) and Standley (1924) are variable within small geographic areas (sometimes from the same locality) and that the states of these characters do not covary consistently among herbarium specimens. Thus, we make the following new combination and recognize a new synonym (herbarium acronyms follow Holmgren et al. [1990] and updates).

Metastelma mexicanum (Brandege) Fishbein & R. Levin comb. nov.—*Melinia mexicana* Brandege, Zoe 5:216. 1905.—*Basistelma mexicanum* (Brandege) Bartlett, Proceedings of the American Academy of Arts and Sciences 44:632. 1909.—TYPE: MEXICO, Sinaloa, about 30 mi. east of Culiacan, near Durango border, Cerro Colorado, 1904, *T. S. Brandege s.n.* (GH!).

Metastelma angustifolium Torr., Report on the U.S. and Mexican Boundary Survey 2:159. 1859, non Turcz., Bjulleten' Moskovskogo Občšestva Ispytatelej Prirody. Otdel Biologičeskij 1852: 315. 1852.—*Melinia angustifolia* (Torr.) A. Gray, Proceedings of the American Academy of Arts and Sciences 12:73. 1877.—*Pattalias angustifolius* (Torr.) S. Watson, Proceedings of the American Academy of Arts and Sciences 24:60. 1889.—*Cynanchum wigginsii* Shinnars, Sida 1:365. 1964.—TYPE: MEXICO, Sonora: Santa Cruz, 1851, *C. Wright 1677* (GH, 3 sheets!, US!).

Metastelma mexicanum grows at the upper elevational limit of tropical deciduous forest and in oak-dominated grassland and woodland in southern Arizona, Sonora, and Sinaloa (Fig. 1). Although it has not yet been collected there, the species is very likely to occur in similar habitats in contiguous southwestern Chihuahua—in the upper watersheds of the Río Yaqui, the Río Mayo, and the Río Fuerte—and perhaps also in northwestern Durango. Like many other members of the genus, it twines on the branches of shrubs and small trees, and upon itself, forming dense tangles under favorable conditions. It is apparently never common; often only a single (occasionally quite robust) individual can be found at any one location (M. Fishbein, personal observation).

Additional specimens examined. MEXICO, Sonora: near Magdalena, 2 Oct 1976, *T. R. Van Devender s.n.* (ARIZ), Jul 1977, *T. R. Van Devender s.n.* (ARIZ), 3 Oct 1982, *G. Starr 180* (ARIZ, CAS), 14 Aug 1983, *T. R. Van Devender s.n.* (ARIZ); Rancho Santa Barbara, 3 Jun 1993, *P. Jenkins 93-88* (ARIZ, MEXU, MO, UCR, USON); Sierra de Alamos, 19 Aug 1992, *V. W. Steinmann s.n.* (ARIZ); Sierra Saguaribo, Aug 1935, *F. Pennell 19,530* (US), 23 Aug 1993, *M. Fishbein 1362* (ARIZ, MO), 24 Aug 1993, *M. Fishbein 1448* (ARIZ). UNITED STATES, Arizona: Cochise Co.: Mule Mountains, 19 Sep 1961, *L. N. Goodding 299-61* (ARIZ), 302-61 (ARIZ), 14 Oct 1961, *L. N. Goodding 439-61* (ARIZ), 5 Sep 1973, *T. R. Wentworth 2211* (ARIZ). Santa Cruz Co.: Canelo Hills, Middle Canyon, 19 Sep 1993, *M. Fishbein 1500* (ARIZ); Pajarito Mountains, Sycamore Canyon, Sep 1976, *J. Kaiser 914* (ARIZ), 13 Aug 1978, *L. J. Toolin 20* (ARIZ), 7 Oct 1981, *T. R. Van Devender s.n.* (ARIZ), 1 Sep 1987, *T. R. Van Devender 87-241* (ARIZ); Patagonia

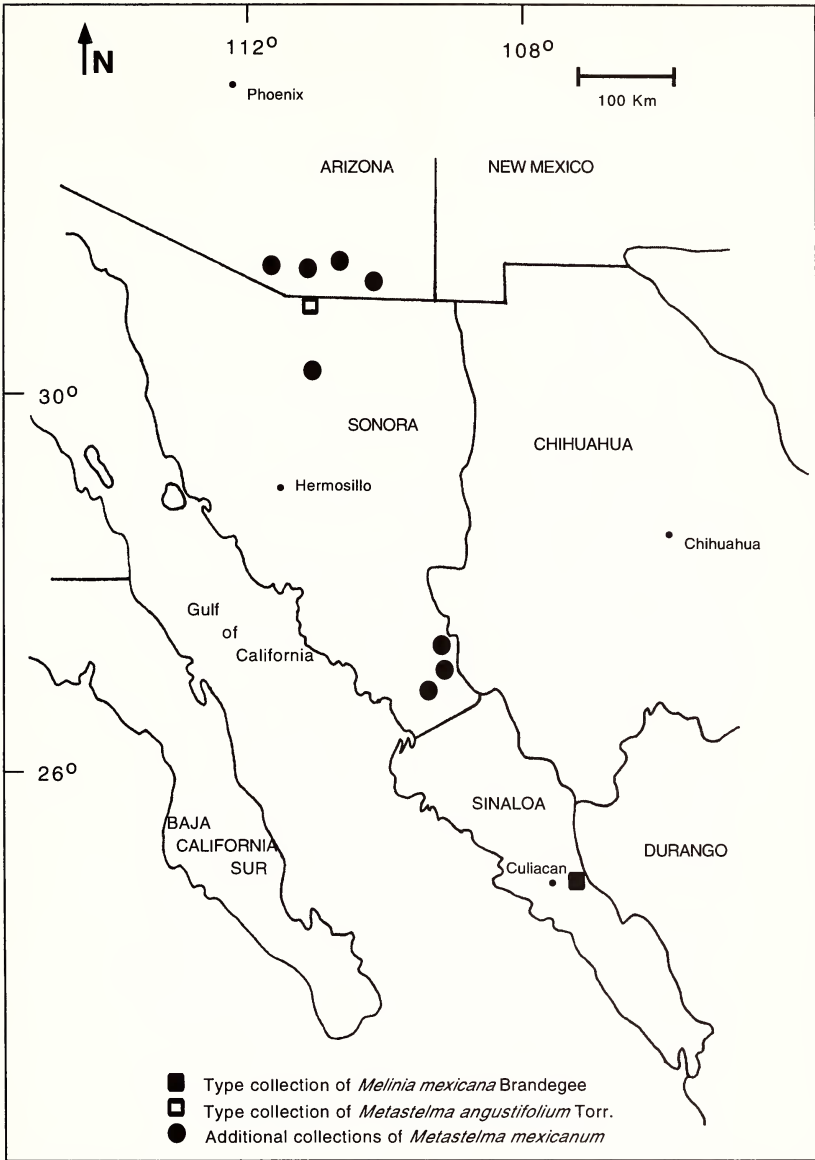


FIG. 1. Known collection localities of *Metastelma mexicanum* in Arizona, U.S., and Sonora and Sinaloa, México. Collection sites within ca. 25 km are represented by a single symbol. Localities of type specimens pertaining to this species are indicated by squares; all other localities are indicated by ovals.

Mountains, 11 Sep 1978, *S. P. McLaughlin 1848* (ARIZ); east of Ruby, 19 Nov 1981, *T. R. Van Devender s.n.* (ARIZ).

Although the earliest epithet applied to this species was *Metastelma angustifolium* Torr., this name was invalid upon publication as a homonym of the slightly earlier *M. angustifolium* Turcz. The earliest validly published basionym pertaining to this species is *Melinia mexicana* Brandegee. (*Melinia* Decne. is now considered to be a relatively distantly related genus in subtribe Oxypetalinae K. Schum. [Liede 1997b].) This species was transferred to *Basistelma* by Bartlett (1909), but has never been assigned to *Metastelma*, necessitating the transfer made here.

Recent treatments of *Metastelma mexicanum* either maintain *Basistelma* as a genus or include *Metastelma* and *Basistelma* in a greatly expanded *Cynanchum*. Kearney and Peebles (1951) recognized *Metastelma* (*M. arizonicum*) and *Basistelma* (*B. angustifolium*) in Arizona. Following Woodson's (1941) concept of an inclusive *Cynanchum*, Shinnars (1964) made several transfers from *Metastelma* to *Cynanchum* and also transferred *Basistelma angustifolium* (proposing the nomen novum, *Cynanchum wigginsii*). This generic concept was followed in the most recent treatment of Arizona plants (Sundell 1994). Recently, Liede (1997a, b) assigned taxa referable to *Metastelma mexicanum* to two different genera (see below, "The status of *Metastelma*").

THE STATUS OF *BASISTELMA*

Basistelma was segregated from *Metastelma* by Bartlett (1909) and Standley (1924) primarily on the basis of the elongate style apex of the two species here considered to be conspecific. However, this character is found in some individuals of *Metastelma arizonicum* A. Gray from the Sonoran Desert, and even in other distantly related asclepiadaceous genera, as in *Matelea cordifolia* (A. Gray) Woodson (M. Fishbein and R. Levin, personal observation). Standley (1924) also contrasted the valvate aestivation of the corolla lobes in bud of *Metastelma* with the contorted, imbricate aestivation of *Basistelma* and *Cynanchum*. However, we have found contorted, imbricate aestivation in some species included in *Metastelma* by Standley (1924), e.g., *M. arizonicum* A. Gray (as *M. watsonianum* Standl.), *M. barbigerum* Scheele, *M. palmeri* S. Watson, and *M. pringlei* A. Gray. Thus, the few characteristics previously used to separate *Basistelma* from *Metastelma* are inadequate and obscure the close relationship among species of these genera. Recognizing *Basistelma* would almost certainly create a paraphyletic *Metastelma*.

THE STATUS OF *METASTELMA*

Liede (1997a) discussed the circumscription and distinguishing features of *Cynanchum* and related genera that occur in the Amer-

icas. Species of *Metastelma* are most similar to those of *Ditassa* R. Br., *Orthosia* Decne., *Tassadia* Decne., and *Cynanchum* sect. *Macbridea* (Raf.) Liede and sect. *Microphyllum* Liede. Compared to other sections of *Cynanchum* and the other genera of Metastelmatinae (Liede 1996, 1997a), these taxa share many characteristics with *Metastelma* (e.g., delicate twining stems; small, relatively narrow leaves that are never deeply cordate at the base; and minute flowers produced in contracted "umbellate" inflorescence units [sensu Fishbein and Venable 1996]). Distinguishing characteristics of these taxa are conveniently summarized by Liede (1997a, Table 1). The most reliable character to differentiate species of *Metastelma* from those of similar taxa, as circumscribed by Liede (1997a), is the composition of the corona. Species of *Metastelma* and *Ditassa* are distinguished from those of related genera by possessing unfused corona segments located only opposite the stamens; in other similar genera, species possess coronas of fused segments positioned both opposite and alternate the stamens (coronas are absent in some species of *Cynanchum* sect. *Macbridea*). Species of these two genera are also the only ones in this group of taxa that possess long, dense, adaxial trichomes of the corolla lobes. *Metastelma* and *Ditassa* (which are strictly South American) are distinguished from each other by the adaxial appendage of the corona segments found only in species of *Ditassa*.

Other characteristics of *Metastelma* appear to be less reliable for distinguishing these species from those of related genera. Liede (1997a, Liede and Meve 1997) suggested that the presence of the distinctive corolline trichomes noted above is the most reliable distinguishing character of *Metastelma*. However, we have found only minute corolline trichomes or papillae in several species in North America that we consider to be unambiguous members of *Metastelma* (e.g., *M. cuneatum* Brandegee, *M. palmeri* A. Gray) and species of *Ditassa* share possession of these trichomes, as noted above (Liede 1997a, Table 1). Liede (1997a, Table 1) also suggested that species of *Metastelma* can be distinguished from most species of *Cynanchum* by the regular production of two fruits (versus one) per flower; however, this characteristic appears to be exceedingly rare in all species of *Metastelma* in North America that we have studied, based on examination of plants in the field and numerous herbarium specimens.

Although the species of *Metastelma* are distinguished from those of similar genera by subtle characteristics, we concur with Liede (1997; Liede and Meve 1997) that the distinctive corona morphology merits generic recognition. Although it is possible that a broadly circumscribed *Cynanchum* may be monophyletic with *Metastelma* (and related genera, e.g., *Ditassa*) nested within (essentially Woodson's [1941] position), recent progress in the systematics of *Cynan-*

chum s.l. suggests the polyphyly of a taxon circumscribed so broadly (Liede 1996). A better case could be made for combining *Metastelma* and *Ditassa*, but, to our knowledge, this generic concept has not been proposed. Unfortunately, simultaneous phylogenetic study of all relevant taxa has not been attempted as yet. Based on existing evidence, recognition of *Metastelma* is warranted.

Surprisingly, Liede (1997b) treated *Basistelma* as a synonym of *Cynanchum*, despite the corona morphology (i.e., unfused segments opposite the stamens) of *Metastelma mexicanum*, which is diagnostic of *Metastelma*. However, Liede (1997a) also placed *C. wigginsii*, inexplicably, in synonymy with *Orthosia kunthii* Decne. (*Cynanchum kunthii* [Decne.] Standl., *Metastelma angustifolium* Turcz.). Species of *Orthosia* were recognized as distinct from those of *Cynanchum* by Liede (1997a) based on the apically dentate or toothed, fused corona segments of *Orthosia* (however, the segments of *O. kunthii* are untoothed [M. Fishbein, personal observation]). Regardless of the correct generic assignment of *O. kunthii*, *M. mexicanum* is clearly not conspecific; specimens that we have identified as *O. kunthii* (we have not seen the type) possess much smaller corollas with shorter, adaxially glabrous lobes, and corona segments that are fused basally. Specimens of *Metastelma mexicanum* possess all of the diagnostic features of *Metastelma*, as noted above, including long, dense adaxial trichomes on the corolla lobes and unfused corona segments opposite the stamens. When identified using Liede's (1997a) key to New World sections of *Cynanchum* and related genera, they are unambiguously assigned to *Metastelma*.

INTRASPECIFIC VARIATION IN *METASTELMA MEXICANUM*

We initially attempted to recognize the southern and northern populations corresponding to *Basistelma mexicanum* and *B. angustifolium* of Bartlett (1909) as distinct subspecies of *Metastelma mexicanum*, but this treatment appears untenable. These entities were distinguished as species by Bartlett (1909) as follows: *B. mexicanum* was said to differ by possessing a shorter style apex, "more fleshy" corona segments, and more recurved apical anther appendages. However, corona segments appear to be uniformly laminate in all specimens that we have examined. It is noteworthy that Standley (1924) omitted this distinguishing character in his treatment. We have found the other two characters to be variable within populations (i.e., herbarium specimens from the same, precise locality) and to not covary consistently. Long and short style apices are present in both northern and southern populations. Apical anther appendages differ more consistently between northern and southern populations than the length of the style apex: those on plants from Arizona and northern Sonora are typically erect or nearly so, whereas those on

plants from southern Sonora and Sinaloa may be erect, but more commonly have recurved tips. We consider this slight and inconstant distinction insufficient for recognition of infraspecific taxa.

CONCLUSION

Metastelma mexicanum is easily distinguished from other species in the genus in North America, as circumscribed by Liede (1997a). The exceedingly narrow, almost filiform leaves are unlike those of any other species in North America, and the elongate style apex is shared only with some plants of *M. arizonicum*. The combination of these two characteristics, in addition to the unique, erect, apical anther appendages, serves to distinguish *M. mexicanum* from other species of *Metastelma* in North America.

Metastelma mexicanum is as yet a poorly known species. We examined all specimens collected in México housed at the cited herbaria and all specimens collected in Arizona housed at ARIZ. The species appears to rare throughout its range (Fishbein and Warren 1994; Levin and Fishbein in Martin et al. 1998). Further collecting on the Pacific slope of the northern Sierra Madre and in the mountains of northeastern Sonora is required to definitively evaluate previously hypothesized patterns of morphological variation within this species. Proposed relationships between *M. mexicanum* and other species of *Metastelma* would be highly speculative at this time. The genus is badly in need of both monographic and phylogenetic study.

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